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(54) **Display element**

(57) A display element (10) comprises a segmented numerical display (12) having a plurality of individually operable display segments (20, 22, 24, 26, 28, 30), and at least one permanently visible indicator marking (14, 16, 18) which is arranged in proximity to the segmented numerical display so as to be pointed to by one of the

display segments (20, 22, 24) when such display segment is illuminated.

The segmented numerical display thus has the double function of providing for a numerical or alphanumeric display and additionally of acting as a pointer for a permanently visible indicator marking that is provided in proximity of the segmented numerical display.

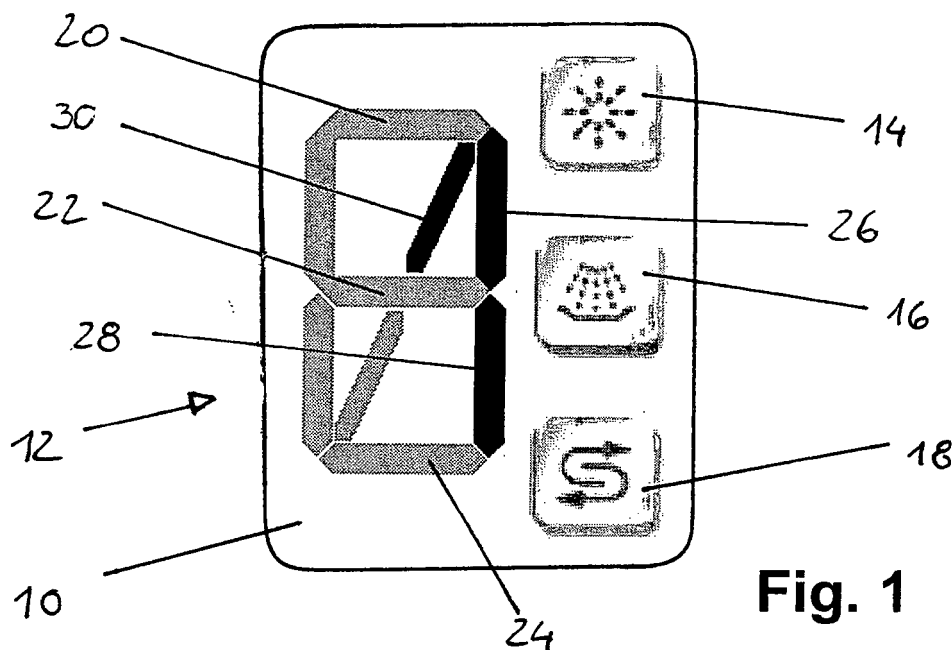


Fig. 1

Description

[0001] The present invention relates to a display element and in particular to a display element comprising a segmented numerical display having a plurality of individually operable display segments.

[0002] Segmented numerical displays find wide application in various devices such as any kind of technical equipment in which numerical or alphanumerical characters are to be displayed, such as measuring instruments, clocks, scales and the like, but also in various appliances in which certain operational parameters are to be displayed to a user, such as in television sets for indicating the selected channel, or in kitchen or household appliances such as dishwashers and washing machines in which there is employed a numerical display which indicates the duration of a program cycle carried out in the household appliance.

[0003] It is an object of the present invention to provide for a display element which has an improved capability of conveying information to a user.

[0004] In a display element comprising a segmented numerical display having a plurality of individually operable display segments the above object is solved in that the display element further comprises at least one permanently visible indicator marking which is arranged in proximity to the segmented numerical display so as to be pointed to by one of the display segments when such display segment is illuminated.

[0005] In accordance with the present invention there is thus provided a display element in which the segmented numerical display has the double function of providing for a numerical or alphanumerical display in the usual manner and additionally to function as a pointer for a permanently visible indicator marking that is provided in proximity of the segmented numerical display. In this manner, on the one hand more information can be provided within a given display area than in known display devices, and on the other hand displays can be implemented that have the same information capability as known devices, but wherein not only less components but also less display area is required for indicating such information, which is of particular advantage in devices wherein only limited space is available for accommodating the display.

[0006] Preferred embodiments of the present invention are defined in the dependent claims.

[0007] In particular, the permanently visible indicator marking can comprise a printing, an embossing, a label, a decal or a combination thereof. The term "embossing" as used herein is meant to refer to any kind of marking which is provided within the surface geometry of the display element, i.e. irrespective of whether the marking is raised or impressed, and irrespective of whether the marking is integrally formed with the display element, such as by injection molding of a thermoplastic display element, or is provided in a separate manufacturing step, such as by stamping or engraving. The indicator marking thus can be provided as a permanent marking, as it also could be implemented by providing for a printing or permanent labeling on the display element. Alternatively, the indicator marking can be made as a replaceable indicator marking, so as to adapt the display element in case that the indicator marking to be pointed to changes, for example due to a firmware update of the appliance in which the display element is used.

[0008] The permanently visible indicator marking may comprise any kind of marking that is suitable to provide operational information to the user and preferably comprises a symbol, such as a pictograph, a text element or a mixture of graphic and text elements. Thus, if for example the display element is employed in a dishwasher to on the one hand indicate the duration of a washing cycle carried out in the dishwasher, and on the other hand to alternatively provide additional information to the user, such as the type of program or program sequence which momentarily is carried out in the dishwasher, or to provide for warning messages such as the necessity to refill regenerating salt, the permanently visible indicator marking may comprise any pictographs that usually are employed in dishwashers, such as for example a schematic representation of a sun to indicate the necessity to refill rinse aid, or a schematic illustration of a spray yet to indicate that presently a rinsing operation is carried out.

[0009] The segmented numerical display can be any kind of segmented display in which the individual display segments can be individually turned on and off, so as to provide by combination of two or more of the display segments a representation of numerals or alphabetic characters. In applications in which the segmented numerical display is employed for displaying the Arabic numerals, the segmented display can be a seven-segment display or a nine-segment display.

[0010] In embodiments in which, in addition or alternatively to numerals, also arbitrary alphabetic characters are to be displayed, the segmented numerical display preferably is a fourteen-segment display or a sixteen-segment display which are particularly suited for displaying not only the Arabic numerals but also the letters of the modern Latin alphabet.

[0011] In preferred embodiments the display element comprises a plurality of permanently visible indicator markings which are aligned to individual display segments.

[0012] Thus, if the segmented numerical display is, for example, a seven-segment display, permanently visible indicator markings can be provided beside the seven-segment display so as to be aligned with the horizontal display segments. In dependency of the size of the indicator markings thus either three indicator markings could be provided on either side of the seven-segment display or, alternatively, two larger markings could be provided which are aligned to the uppermost and the lowermost, respectively, of the horizontal display segments.

[0013] Alternatively or additionally, permanent markings could be provided below or above the segmented display so

as to be associated with any one of the horizontal display segments. Particularly if the segmented display is a fourteen- or sixteen-segment display, markings also could be provided in proximity to the corners of the segmented numerical display, wherein the markings thus could be pointed to either by the diagonal display segments or by illuminating several display segments in the shape of an arrow which points to the permanently visible indicator marking.

[0014] In case that the display element shall be adapted to display multi-digit numerals, the display element can comprise a corresponding plurality of segmented numerical displays.

[0015] While the present invention can be used to advantage with any kind of segmented numerical display, the segmented numerical display preferably comprises a liquid crystal display, a vacuum fluorescent display or an array of light-emitting diodes, in which manner numerical displays can be implemented which can be readily implemented at low costs and in virtually any size.

[0016] In a further aspect the present invention provides an appliance comprising a display element as it was referred to above, which appliance further comprises a control unit for selectively and individually operating the display segments.

[0017] In such an appliance the control unit thus preferably is adapted to selectively operate the display segments in combination so as to indicate numerical or alphanumeric symbols, such as the Arabic numerals or the letters of the Latin alphabet, wherein the control unit further can selectively operate the display segments individually, or again in combination, such as in the shape of an arrow, so as to point to one or more of the permanently visible indicator markings.

[0018] The appliance can be a household appliance, and particularly can be a washing machine or a dishwasher. Such appliances often comprise on the one hand a numerical display so as to indicate to the user the duration of a washing cycle carried out in the appliance and on the other hand a plurality of pictographical indicators which are related to certain parameters of the washing cycle, such as the type of the washing cycle, the instantaneous stage of the washing program, or which provide for a warning message such as in a dishwasher the need to refill regenerator salt or rinse aid. While in the display element of the present invention the segmented numerical display has the double function of providing for a numerical or alphanumeric display and additionally is employed as a pointer to a permanently visible indicator marking, the present invention thus can be used to advantage in such appliances to provide for displays that require less space than known displays but still are able to convey the same or even a larger information content as known devices.

[0019] Preferred embodiments of the present invention are described below by reference to the drawings, in which:

Fig. 1 illustrates a display element comprising a nine-segment display;

Fig. 2 shows an embodiment comprising two sixteen-segment displays;

Fig. 3 illustrates an embodiment of a display element for use in a dishwasher wherein the segmented display is used to display numerical information;

Fig. 4 shows the display of Fig. 3 when the segmented numerical display is operated to point to an indicator marking;

Fig. 5 illustrates a seven-segment display; and

Fig. 6 depicts an operation table for operating the display of Fig. 5.

[0020] In Fig. 1 there is shown a display element 10 which is designed for use in a dishwasher and which in the embodiment shown in Fig. 1 comprises a nine-segment numerical display in which the individual display segments can be turned on and off individually so as to indicate any of the Arabic numerals from "0" to "9". Display 10 further comprises three permanently visible indicator markings 14, 16 and 18 which refer to certain operational states of the dishwasher. While the segmented numerical display 12 can be employed for example to indicate a program number, such as the digit "1" which as shown in Fig. 1 can be displayed by illuminating the upper right vertical display segment 26, the lower right vertical display segment 28 and the upper diagonal display segment 30, the segmented numerical display 12 further can be employed to point to any of the permanent markings 14, 16 and 18 by illuminating associated display segments. Thus, in order to point to permanent marking 14 which in the embodiment shown in Fig. 1 indicates that rinse aid should be refilled, any display segments which before were used to indicate a number are turned off and instead the upper horizontal display segment 20 which is aligned to indicate a marking 14 is illuminated. Similarly, in case that the segmented numerical display 12 shall be used to indicate that a rinse stage is in progress, the central horizontal display segment 22 which is aligned to indicate the marking 16 is turned on while all the vertical and diagonal display segments are switched off. In case that numerical display 12 is to be operated to point to indicator marking 18 which indicates that regenerating salt should be refilled, lower horizontal display segment 24 is illuminated.

[0021] Fig. 2 shows a display element 32 which comprises a first sixteen-segment display 34 and a second sixteen-segment display 36 which can be employed to display two digit numerals or alphabetic characters. Similarly, as in the

embodiment shown in Fig. 1, display element 32 comprises permanently visible indicator markings 38, 40 and 42 which are arranged to the right of sixteen-segment display 36, wherein the indicator markings 38, 40 and 42 are aligned to the horizontal display segments of sixteen-segment display 36. Display element 32 further comprises additional permanently visible indicator markings such as an indicator marking 44 to indicate that a washing program for delicate articles such as glasses has been selected, or an indicator marking 46 which indicates that a "three-in-one" multi-component detergent tablet has been loaded into the detergent container of the dishwasher. Indicator markings 44 and 46 are aligned to the lower left horizontal display segments 47 of sixteen-segment displays 34 and 36, respectively, which can be illuminated individually to indicate that the operational state depicted by indicator markings 44 and/or 46 applies.

[0022] In Fig. 3 there is shown a display element 48 for a dishwasher which comprises a plurality of indicator markings 50 which are printed onto the display, wherein for each indicator marking 50 there is provided an indicator lamp 52, such as an LED, which can be illuminated to point to the respective indicator marking. Display element 48 further comprises a numerical display 54 which in the embodiment shown in Fig. 3 comprises two seven-segment displays which can be employed to indicate the duration of a washing cycle carried out in the dishwasher. To the right of numerical display 54 there are provided additional indicator markings 58. In contrast to indicator markings 50, the additional indicator markings 58 do not have an indicator lamp associated therewith. Rather, in order to point for example to indicator markings 58, the upper horizontal display segment 56 which is aligned to the indicator marking 58 is illuminated, as it is shown in Fig. 4.

[0023] While numerical display 54 thus either can be used to indicate numerals or to act as marker for any of the additional permanently visible markings 58 and 60, numerical display 54 can be operated either continuously in either one of these operating modes, or can be operated to provide for both indications in an alternating sequential manner.

[0024] In Fig. 5 there is shown a seven-segment display as it can be employed in the numeric display 54 shown in Figs. 3 and 4. Seven-segment display 62 comprises an upper horizontal display segment 64, an upper right vertical display element 66, a lower right vertical display element 68, a lower horizontal display segment 70, a lower left vertical display segment 72, an upper left vertical display segment 74 and a central horizontal display element 76.

[0025] Fig. 6 shows an operating table of the seven-segment display 62 shown in Fig. 5. In case that the seven-segment display 62 shall display the numeral 0, as illustrated in Fig. 3, display segments 64, 66, 68, 70, 72 and 74 all are turned on whereas display segment 76 is turned off. If on the other hand numerical display 62 shall be used to point to indicator marking 58 so as to indicate that regenerating salt should be refilled, all the display segments except segment 64 are turned off. Similarly, in case that display 62 shall point to indicator marking 60 shown in Fig. 4 so as to indicate that rinse aid should be refilled, only the lower horizontal vertical display segment 70 is turned on while all other display segments are turned off. Of course, if applicable, the seven-segment display 62 also can be operated to point to more than one indicator marking at the same time, such as to markings 58 and 60 by illuminating both the upper and the lower horizontal vertical display segments while all other display segments are turned off.

List of reference signs

[0026]

10	display element
12	nine-segment display
14, 16, 18	indicator marking
20, 22, 24	horizontal display segments
26, 28	vertical display segments
30	diagonal display segment
32	display element
34, 36	sixteen-segment display
38, 40, 42, 44, 46	indicator marking
47	display segment
48	display element

50	indicator marking
52	indicator lamp
5 54	numerical display
56	display segment
58, 60	indicator marking
10 62	seven-segment display
64, 66, 68, 70, 72, 74, 76	display segments

Claims

1. A display element (10; 32; 48) comprising:

a segmented numerical display (12; 34, 36; 62) having a plurality of individually operable display segments (20, 22, 24, 26, 28, 30; 47; 56; 64, 66, 68, 70, 72, 74, 76), and at least one permanently visible indicator marking (14, 16, 18; 38, 40, 42, 44, 46; 58, 60) which is arranged in proximity to the segmented numerical display so as to be pointed to by one of the display segments when such display segment is illuminated.

2. The display element of claim 1, wherein said permanently visible indicator marking (14, 16, 18; 38, 40, 42, 44, 46; 58, 60) comprises a printing, an embossing, a label, a decal or a combination thereof.

3. The display element of claim 1 or 2, wherein said permanently visible indicator marking (14, 16, 18; 38, 40, 42, 44, 46; 58, 60) comprises a symbol or a text element.

4. The display element of any one the preceding claims, wherein the segmented numerical display (12; 34, 36; 62) comprises a seven-segment display, a nine-segment display, a fourteen-segment display or a sixteen-segment display.

5. The display element of any one the preceding claims, comprising a plurality of permanently visible indicator markings (14, 16, 18; 38, 40, 42, 44, 46; 58, 60) which are aligned to individual display segments (20, 22, 24; 47; 56; 64, 70).

6. The display element of any one the preceding claims, comprising a plurality of segmented numerical displays (34, 36).

7. The display element of any one the preceding claims, wherein said segmented numerical display (12; 34, 36; 62) comprises a liquid crystal display, a vacuum fluorescent display or an array of light-emitting diodes.

8. An appliance comprising a display element as defined in any one the preceding claims and a control unit for selectively and individually operating the display segments (20, 22, 24, 26, 28, 30; 47; 56; 64, 66, 68, 70, 72, 74, 76).

9. The appliance of claim 8, wherein said control unit is adapted to selectively operate said display segments (20, 22, 24, 26, 28, 30; 47; 56; 64, 66, 68, 70, 72, 74, 76) in combination to indicate numerical or alphanumeric symbols, or to operate said display segments individually to point to one or more of the indicator markings (14, 16, 18; 38, 40, 42, 44, 46; 58, 60).

10. The appliance of claim 8 or 9, wherein said appliance is a household appliance, and preferably is a washing machine or a dishwasher.

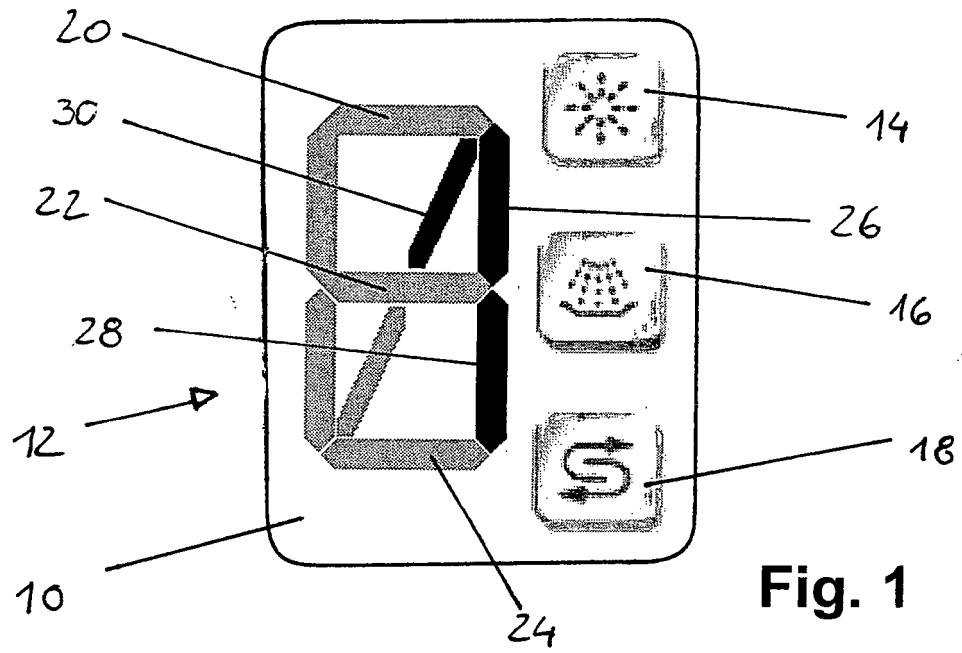


Fig. 1

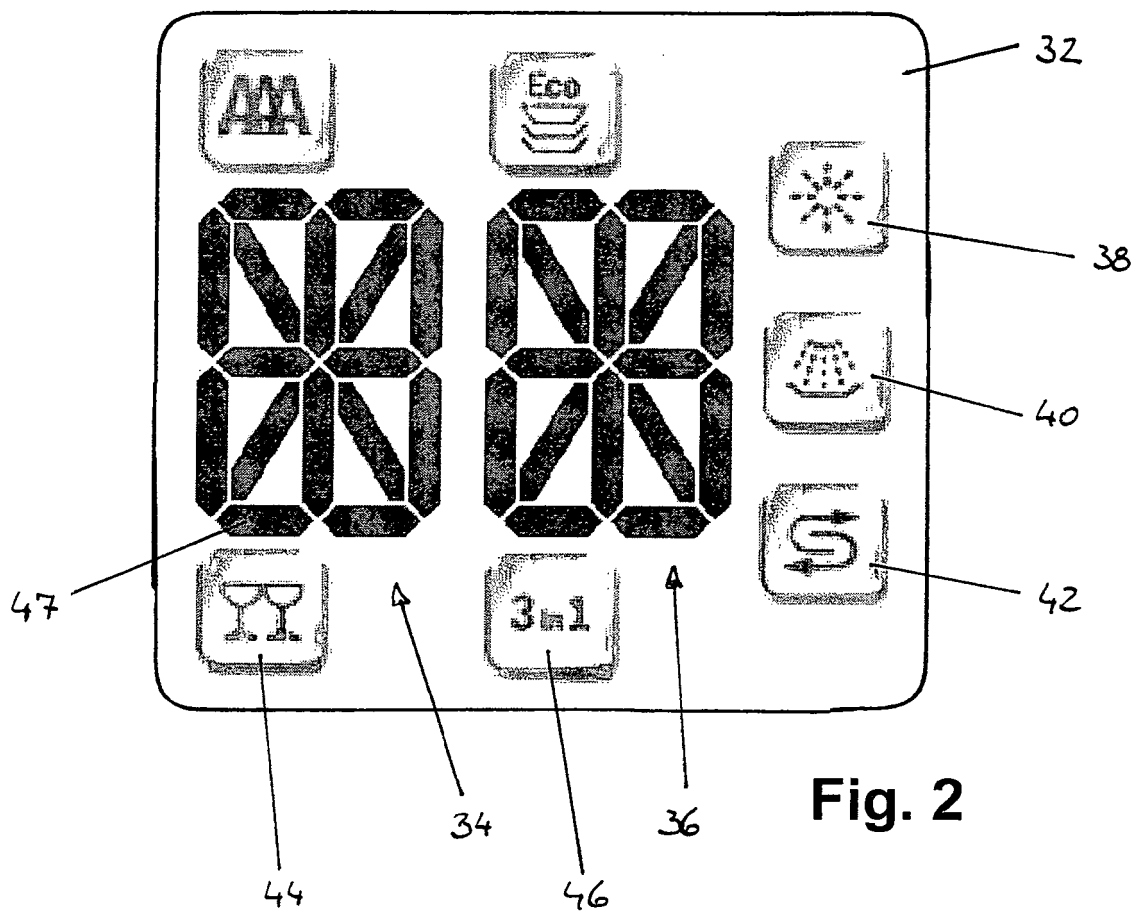


Fig. 2

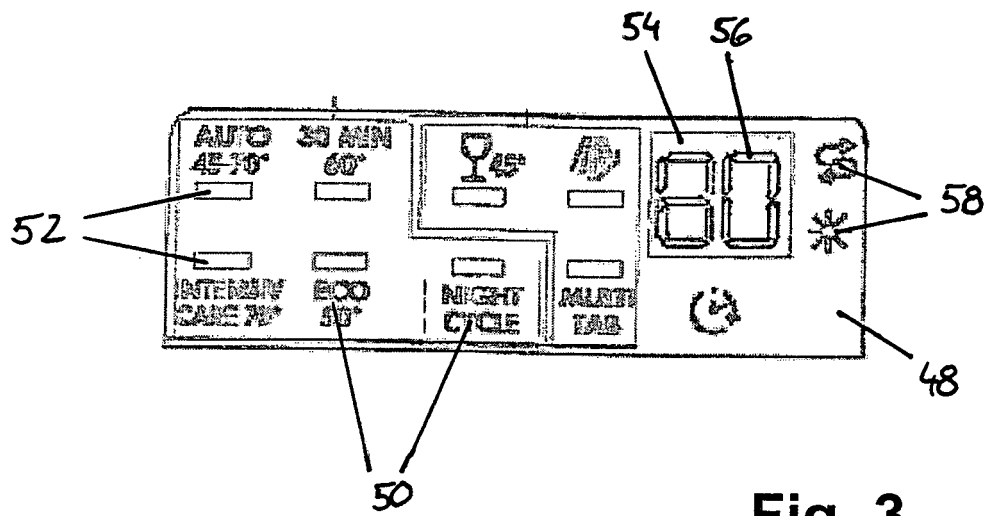


Fig. 3

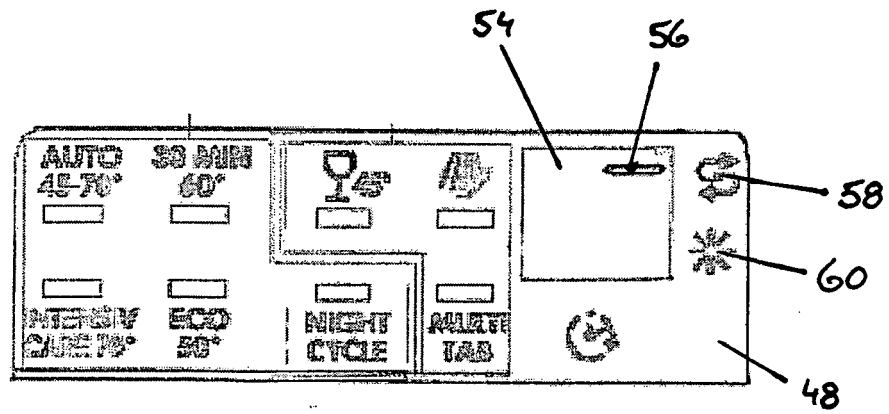


Fig. 4

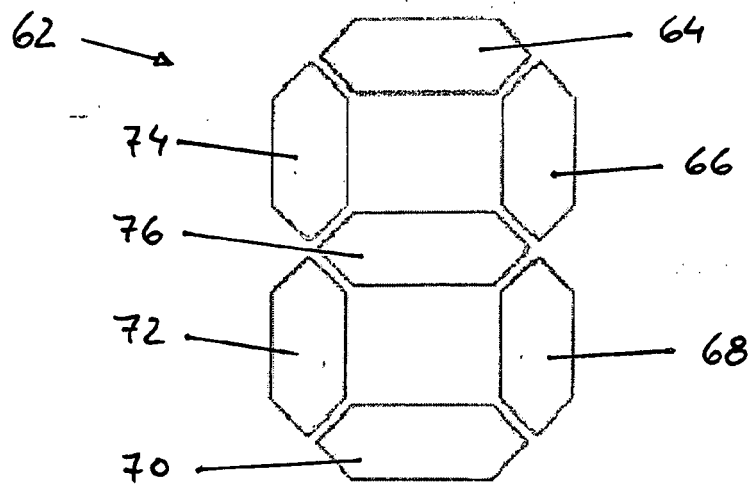


Fig. 5

Segment Display	64	66	68	70	72	74	76
0	on	on	On	on	on	on	off
1	off	on	On	off	off	off	off
2	on	on	off	on	on	off	on
3	on	on	On	on	off	off	on
4	off	on	On	off	off	on	on
5	on	off	On	on	off	on	on
6	on	off	On	on	on	on	on
7	on	on	On	off	off	off	off
8	on	on	On	on	on	on	on
9	on	on	On	on	off	on	on
\$	on	off	off	off	off	off	off
*	off	off	off	on	off	off	off

Fig. 6



EUROPEAN SEARCH REPORT

Application Number
EP 11 00 0523

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 EPO FORM 1503 03.82 (P04C01)



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